

CLAIMS

Claims 1-69 were pending at the time of the Office Action with claims 23-69 withdrawn from consideration.

Claims 1 and 3 are amended.

Claims 1-69 are pending with claims 23-69 withdrawn from consideration..

1. (Currently Amended) A clamp for securing a work piece during a manufacturing operation, comprising:

a support arranged to at least partially surround a circumference defining a work area on the work piece, the support having a first end movable relative to a surface of the work piece; and

at least one rotatable friction reducing element disposed at the first end and ~~configured to be~~ at least partially supported at the first end by one of a fluid pressure and or a gas pressure adapted to facilitate a rotation of the friction reducing element and disposed between the support and the work piece, the friction reducing element adapted to at least partially surround the ~~circumference~~ work area and to apply a clamping pressure to the surface when the clamp is engaged with the work piece and moved across the work piece.

2. (Original) The clamp of Claim 1, wherein the support is adapted to substantially surround the circumference.

1 3. (Currently Amended) The clamp of Claim 1, further comprising
2 ~~wherein the work area includes a friction stir welding area~~ tool disposed within
3 the work area.

4
5 4. (Original) The clamp of Claim 1, wherein the circumference surrounds
6 and is larger than a diameter of a friction stir welding tool.

7
8 5. (Original) The clamp of Claim 1, wherein the support includes a
9 cylinder.

10
11 6. (Original) The clamp of Claim 1, wherein the friction reducing element
12 includes a lubricant.

13
14 7. (Original) The clamp of Claim 1, wherein the friction reducing element
15 includes a low friction material.

16
17 8. (Original) The clamp of Claim 7, wherein the low friction material
18 includes TEFLON®.

19
20 9. (Original) The clamp of Claim 1, wherein the friction reducing element
21 includes a self-lubricating material.

22
23 10. (Original) The clamp of Claim 9, wherein the self lubricating material
24 includes one of high-carbon cast iron, carbon graphite impregnates, molydisulfide
25 impregnates, and metal polymer hybrids.

1
2 11. (Original) The clamp of Claim 1, wherein the friction reducing element
3 includes a plurality of ball bearings.
4

5 12. (Original) The clamp of Claim 11, wherein the plurality of ball bearings
6 are at least partially held against the surface by fluid pressure.
7

8 13. (Original) The clamp of Claim 11, wherein the plurality of ball bearings
9 are at least partially held against the surface by gas pressure.
10

11 14. (Original) The clamp of Claim 1, wherein the friction reducing element
12 includes a plurality of roller bearings.
13

14 15. (Original) The clamp of Claim 14, wherein the roller bearings are held
15 in pivoting holders.
16

17 16. (Original) The clamp of Claim 1 wherein the friction reducing element
18 includes a race of bearings.
19

20 17. (Original) The clamp of Claim 1, wherein the friction reducing element
21 includes a plurality of pivoting and rolling castors.
22

23 18. (Original) The clamp of Claim 1, wherein the friction reducing element
24 includes a pressurized gas adapted to apply pressure to the surface.
25

1 19. (Original) The clamp of Claim 1, wherein the friction reducing element
2 includes a pressurized fluid arranged to apply pressure to the surface
3

4 20. (Original) The clamp of Claim 1, wherein the support includes a
5 mechanism to move the first end towards and away from the surface.
6

7 21. (Original) The clamp of Claim 20, wherein the mechanism includes at
8 least one of a spring, a cam, a threaded adjusting link, a pneumatic actuator, a
9 solenoid, an electromagnetic actuator, and a hydraulic actuator.
10

11 22. (Original) The clamp of Claim 20, wherein the mechanism includes a
12 feedback system to maintain a specified pressure against the surface.
13

14 23. (Withdrawn) An apparatus for performing a manufacturing
15 operation on a work piece, comprising:

16 a manufacturing tool;

17 a support adapted to at least partially surround the manufacturing tool, the
18 support having a first end positioned to move relative to the
19 manufacturing tool; and

20 a friction reducing element attached to the first end, the friction reducing
21 element adapted to at least partially surround the manufacturing tool
22 and to apply a clamping pressure to the surface around the
23 manufacturing tool.
24
25

1 24. (Withdrawn) The clamp of Claim 23, wherein the manufacturing
2 tool includes a welding tool.

3
4 25. (Withdrawn) The clamp of Claim 24, wherein the welding tool
5 includes a friction stir welding tool.

6
7 26. (Withdrawn) The clamp of Claim 23, wherein the support is adapted
8 to substantially surrounding the manufacturing tool.

9
10 27. (Withdrawn) The clamp of Claim 23, wherein the support is adapted
11 to co-annularly surround the manufacturing tool.

12
13 28. (Withdrawn) The clamp of Claim 23, wherein the support includes a
14 cylinder substantially surrounding the friction stir welding tool.

15
16 29. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
17 element includes TEFLON®

18
19 30. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
20 element includes a self lubricating material.

21
22 31. (Withdrawn) The clamp of Claim 30, wherein the self lubricating
23 material includes one of high-carbon cast iron, carbon graphite impregnates,
24 molydisulfide impregnates and metal polymer hybrids.

1 32. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
2 element includes a plurality of ball bearings.

3
4 33. (Withdrawn) The clamp of Claim 32, wherein the plurality of ball
5 bearings are at least partially held against the surface by gas pressure.

6
7 34. (Withdrawn) The clamp of Claim 23 wherein the friction reducing
8 element includes a plurality of roller bearings.

9
10 35. (Withdrawn) The clamp of Claim 34 wherein the roller bearings are
11 held in pivoting holders.

12
13 36. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
14 element includes a race of bearings.

15
16 37. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
17 element includes a plurality of pivoting and rolling casters.

18
19 38. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
20 element includes a pressurized gas arranged to apply pressure to the surface.

21
22 39. (Withdrawn) The clamp of Claim 23, wherein the friction reducing
23 element includes a pressurized fluid arranged to apply pressure to the surface
24
25

1 40. (Withdrawn) The clamp of Claim 23, wherein the support includes a
2 mechanism to move the first end towards and away from the surface.

3
4 41. (Withdrawn) The clamp of Claim 40, wherein the mechanism
5 includes at least one of a spring, a cam, a threaded adjusting link, a pneumatic
6 actuator, a solenoid, an electromagnetic actuator, and a hydraulic actuator.

7
8 42. (Withdrawn) The clamp of Claim 40, wherein the mechanism
9 includes a feedback system to maintain a specified pressure against the surface.

10
11 43. (Withdrawn) A clamp for securing a work piece during a
12 manufacturing operation, comprising:

13 a plurality of supports arranged to at least partially surround a
14 manufacturing tool, each of the plurality of supports having a first end
15 positionable relative to a surface of the work piece independent of the
16 manufacturing tool and at least partially independent of the other
17 supports; and

18 a plurality of friction reducing elements, each friction reducing element
19 attached to the first end of each of the plurality of supports, the friction
20 reducing elements arranged to at least partially surround a working
21 end of the manufacturing tool and to apply a movable clamping
22 pressure to the surface around the manufacturing tool.

23
24 44. (Withdrawn) The clamp of Claim 43, wherein the manufacturing
25 tool includes a welding tool.

1
2 45. (Withdrawn) The clamp of Claim 44, wherein the welding tool
3 includes a friction stir welding tool.

4
5 46. (Withdrawn) The clamp of Claim 43, wherein the plurality of
6 supports are adapted to substantially surrounding the manufacturing tool.

7
8 47. (Withdrawn) The clamp of Claim 43, wherein the plurality of
9 supports are adapted to coannularly surround the manufacturing tool.

10
11 48. (Withdrawn) The clamp of Claim 43, wherein the each of the
12 plurality of supports includes a holder arranged to hold a friction reducing
13 element.

14
15 49. (Withdrawn) A method for clamping during a manufacturing
16 operation on a work piece, comprising:

17 applying a clamping force against the work piece, the clamping force

18 being distributed over a clamping area that at least partially surrounds

19 a work area on the work piece;

20 operatively engaging the work area with a manufacturing tool;

21 moving the work area by moving the manufacturing tool with the

22 manufacturing tool operatively engaging the work area; and

23 moving the clamping area simultaneously with moving the work area, by

24 moving the clamping area upon which the clamping force is applied

25 along with moving the manufacturing tool.

1
2 50. (Withdrawn) The method of Claim 49, wherein manufacturing tool
3 includes a welding tool.
4

5 51. (Withdrawn) The method of Claim 50, wherein the welding tool
6 includes a friction stir welding tool.
7

8 52. (Withdrawn) The method of Claim 49, wherein the clamping area
9 substantially surrounding the manufacturing tool.
10

11 53. (Withdrawn) The method of Claim 49, wherein the clamping area
12 coannularly surrounds the manufacturing tool.
13

14 54. (Withdrawn) The method of Claim 49, wherein applying a clamping
15 force includes clamping the work piece before operatively engaging the work area
16 with the manufacturing tool.
17

18 55. (Withdrawn) The method of Claim 49, further comprising
19 conforming the clamping area to match a surface contour of the work piece.
20

21 56. (Withdrawn) A method for clamping during friction stir welding,
22 comprising:

23 clamping a work piece co-annularly around the circumference of a
24 working end of friction stir welding tool; and
25

1 moving the clamping with the friction stir welding tool during friction stir
2 welding.

3
4 57. (Withdrawn) The method of Claim 56, wherein clamping a work
5 piece coannularly includes clamping the work piece before engaging the work
6 piece with the friction stir welding tool.

1 58. (Withdrawn) The method of Claim 56, further comprising:
2 conforming the clamping to match a surface contour of the work piece.
3

4 59. (Withdrawn) A device for clamping during a manufacturing
5 operation, the apparatus comprising:

6 means for applying clamping pressure to a work piece around at least a
7 portion of a working end of a manufacturing tool working on the work
8 piece; and

9 means for reducing friction between the means for applying clamping
10 pressure and the work piece.
11

12 60. (Withdrawn) The apparatus of Claim 59, wherein the manufacturing
13 tool includes a welding tool.
14

15 61. (Withdrawn) The apparatus of Claim 60, wherein the welding tool
16 includes a friction stir welding tool.
17

18 62. (Withdrawn) The apparatus of Claim 59, wherein the means for
19 applying clamping pressure include means for applying clamping pressure to a
20 work piece at least partially surrounding a working end of a manufacturing tool
21 working on the work piece.
22
23
24
25

1 63. (Withdrawn) The apparatus of Claim 59, wherein the means for
2 applying clamping pressure include means for applying clamping pressure to a
3 work piece co-annularly surrounding a working end of a manufacturing tool
4 working on the work piece.

5
6 64. (Withdrawn) The apparatus of Claim 59, further comprising means
7 for conforming the clamping pressure to a surface contour of work piece.

8
9 65. (Withdrawn) The apparatus of Claim 59, wherein the means for
10 reducing friction include rolling means.

11
12 66. The apparatus of Claim 59, wherein the means for reducing friction
13 includes pivoting means.

14
15 67. (Withdrawn) The apparatus of Claim 59, wherein the means for
16 reducing friction include pressurized gas means.

17
18 68. (Withdrawn) The apparatus of Claim 59, wherein the means for
19 reducing friction include pressurized fluid means.

20
21 69. (Withdrawn) The apparatus of Claim 59, wherein the means for
22 reducing friction include lubricating means.